Arun Duggal Centre of Excellence for Research in Climate Change and Air Pollution
Indian Institute of Technology Delhi
Monthly Newsletter November 2023

Editorial

Dear Readers

We are facing a serious Air Pollution Crises in Delhi NCR. Air is so polluted that there is haze all around and we have not seen the sun for days. Even the moon on Karva Chauth, generally so beautiful, looked very sad and subdued because of Air Pollution. As you step outside, you can smell, taste, and see the thick soup of pollutants in the air. Let's be very clear that this is a man-made crisis and can only be dealt with by the collective will of the people and concerted action by the government. Its causes are well known, mainly fossil fuels: petrol and diesel vehicular emissions, coal-fired power plants, industrial emissions, wood burning and some episodical actions like stubble burning and Diwali crackers. There has been some action in all of these areas, but much more needs to be done.

The good news is that we know what success looks like because we have seen it. During Covid, in 2020, because of low vehicular traffic and thermal energy generation, we could see the snowcapped Himalayan peaks from the plains. It was less than two months ago, during G20, that restrictions on vehicular traffic and favorable weather in Delhi NCR resulted in the lowest PM2.5 level of 11 ug/m3, making it the best Air Quality capital in the world.

How things change; the PM2.5 level last night was 589 ug/m3. This massive deterioration in air quality seems to be due to very high Diwali-related vehicular traffic, and stubble burning accentuated by weather conditions.

We know the path to a cleaner, better future. It requires the determination of all of us to change our lifestyles and invest in technologies already available and under development. Major elements are :

- Public awareness of Air Quality in their city/neighborhood and the health impact of air pollution. This message can be forcefully transmitted through schools, colleges, and healthcare professionals.
- Further acceleration in the installation of renewable power and phase-out of thermal power.
- Rapid adoption of Electric Vehicles, Two-wheelers, Three-wheelers, and Cars.Small commercial vehicles

and Buses. Higher Taxes on the purchase and ownership of Internal Combustion (IC) vehicles, and on the use of diesel and petrol, development of Public charging infrastructure, and restricting or charging for use of IC vehicles in certain parts of cities. London and Nordic countries have shown a way to shift from IC vehicles to electric.

- All new Government cars and vehicles are to be EVs. This significantly helps Delhi NCR and State capitals.
- Great expansion in availability and use of Public Transportation and reduction in personal two-wheelers and cars as done by Singapore. This has the additional benefit of reducing road congestion,
- Development of Hydrogen technologies for industrial and heavy vehicle use.
- Redesign of roads, one-way streets, pedestrian pavements, and cycle lanes in cities, and Architectural design of New Cities where walking or bicycling for going to school, work, shopping, and entertainment is the way of life.

Let's not waste this Air Pollution crises but take determined steps to prevent it in the future.

"Clean Air is our birthright."

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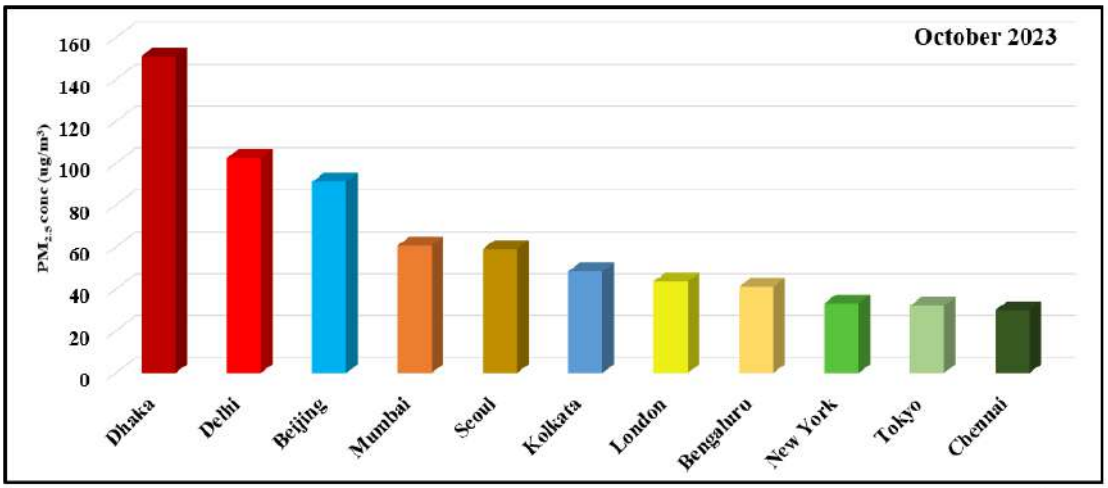
Indian & International Cities- October 2023

Dhaka has the highest pollution levels

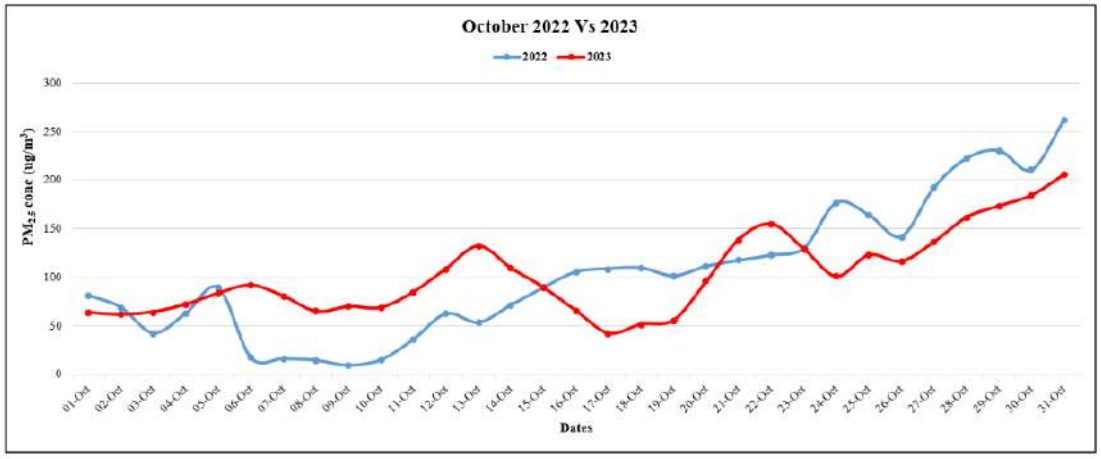


Source:
CPCB (Indian Cities)
aqicn.org (Other Cities)

The graph above shows the daily average PM2.5 for the month of October 2023. Amongst the major metros worldwide, **Dhaka** has shown the highest concentration of PM2.5 followed by Delhi and Beijing.

Delhi $PM_{2.5}$ (24 hr. daily average) Trend

October 2022 Vs 2023



Source: CPCB

In October, the average PM2.5 concentration was 102.5 ug/m3 for the current year 2023 as compared to the previous year (104.4 ug/m3 for October 2022). The amount of PM2.5 has fluctuated in some days and increased in others.

****Stations with missing values for more than 15 days have been excluded*

The CERCA virtual Expert Monthly Talk series spotlights on various pressing issues, including air pollution and climate change. It serves as a platform for distinguished speakers from across the globe to impart their knowledge and perspectives.

To register for this Talk, Click here

CERCA Events

Expert Talk delivered by Dr. Santosh Harish on 30th October 2023

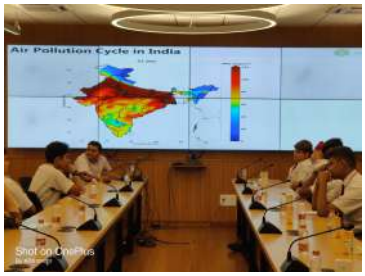
Dr. Santosh Harish delivered a talk on **"A funder's perspective on the landscape of air quality work in India"**.

Dr. Santosh Harish discussed on Open Philanthropy's South Asian Air Quality program, covering grant-making philosophy, sub-strategies, and identifying critical gaps in the air quality landscape. His talk was a valuable resource for individuals and organizations seeking funding opportunities in air quality initiatives, offering insights into the priorities and constraints philanthropic funders consider. Dr. Harish's discussion extended to India's air quality governance framework, emphasizing the program's potential impact in the region.

The post-lecture Q&A session facilitated direct engagement, allowing attendees to seek clarification and gain a deeper understanding of the South Asian Air Quality program and its philanthropic contributions. Dr. Santosh Harish's lecture left a lasting impact, offering valuable insights into the critical field of air quality and philanthropy, and inspiring further exploration and action in this essential area. We are grateful for his contribution and the knowledge he shared during this informative session.

Interaction with Don Bosco School High School Students (Class XI and XII)

On 16th & 17th October 2023, the Center for Atmospheric Sciences (CAS) at IIT Delhi organized a two-day Interaction event with Don Bosco School High School Students, comprising Class XI and XII supported by CERCA. This event aimed to provide an educational and engaging experience for the students and offer insights into various aspects of climate science, oceanography, history, and air pollution. The event served as a powerful platform for knowledge exchange, fostering a deeper understanding of pressing global issues and igniting the passion for learning and exploration in the bright young minds of our future leaders.
The agenda for the second day followed the same schedule and topics as the first day, providing an opportunity for additional students to benefit from the informative presentations and engage with experts in various fields. The engagement and enthusiasm displayed by the students, as well as their active participation during the feedback session, were commendable. The organizers expressed sincere gratitude to all the professors and staff who contributed to the event's success, as well as the students for their active participation. This event served as an excellent platform for knowledge exchange and awareness building on critical environmental and scientific topics.



CERCA Outreach

With a vision to support India's commitment to combat climate change and air pollution, CERCA is delighted to announce a collaboration with **Clean Air Fund**. **Prof. Sagnik Dey**, faculty coordinator in CERCA is the PI of the project, along with **Prof Dilip Ganguly**, co-PI, from **IIT Delhi** will be leading this project.

India's strong commitment to combat climate change and air pollution requires an interdisciplinary and evidence-based approach. This project aims to generate India-specific evidence on the health and climate impacts of air pollution. By linking clean air and climate actions seamlessly, the project will provide strategic knowledge to Indian policymakers, aiding in prioritizing emission reduction sectors for maximum health and climate benefits.

The **Arun Duggal Centre of Excellence for Research in Climate Change and Air Pollution (CERCA) at IIT Delhi** will assist in implementing various outreach activities envisaged under the project. At CERCA, we have always been dedicated to creating positive change, and this new partnership takes our commitment to a whole new level. With a shared vision and aligned goals, we are confident that this project will bring about transformative results. As we embark on this exciting journey, we invite all stakeholders to register for our newsletter subscription and know more about its future activities.

Stay tuned for regular updates on the progress and impact of this project.

Kindly use this button below to register:

Register here

Cumulative effect of $PM_{2.5}$ components is larger than the effect of $PM_{2.5}$ mass on child health in India

Ekta Chaudhary, Franciosalgeo George, Aswath Saji, Sagnik Dey, Santu Ghosh, Tinku Thomas, Anura. V. Kurpad, Sumit Sharma, Nimish Singh, Shivang Agarwal & Unnati Mehta

- Existing research on the impact of ambient fine particulate matter (PM2.5) exposure on child health is available, but the specific effects of different PM2.5 species remain unexplored in lower and middle-income countries.
- Through multiple logistic regression, the study reveals that for every 10 μg m−3 increase in PM2.5 exposure, the prevalence of anemia, acute respiratory infection, and low birth weight in Indian children increases by 10%, 11%, and 5%, respectively.
- Certain PM2.5 species, such as NO3-, elemental carbon, and NH4+, show stronger associations with these health outcomes compared to other PM2.5 components.
- The study underscores that using total PM2.5 mass as a surrogate marker for air pollution exposure may underestimate the collective impact of various PM2.5 components, emphasizing the need to prioritize strategies that reduce exposure to more harmful species for the betterment of child health in India.

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The global and regional air quality impacts of dietary change

Marco Springmann, Rita Van Dingenen, Toon Vandyck, Catharina Latka, Peter Witzke & Adrian Leip

- Air pollution is linked to increased cardiovascular and respiratory disease risk, as well as decreased cognitive and physical performance.
- Food production, particularly the production of animal products, is a significant source of methane and ammonia emissions, which contribute to air pollution by generating particulate matter and ground-level ozone.
- Shifting towards more plant-based diets like flexitarian, vegetarian, and vegan options could result in substantial reductions in air pollution, leading to health benefits such as a reduction in premature mortality.
- Implementing dietary changes towards plant-based diets has the potential to enhance economic productivity, with estimated gains of USD 0.6-1.3 trillion, making it a valuable strategy for mitigating air pollution and its associated health and economic consequences, particularly in regions with intensive agriculture and high population density.

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An environmental justice analysis of air pollution in India

Priyanka N. deSouza, Ekta Chaudhary, Sagnik Dey, Soohyeon Ko, Jeremy Németh, Sarath Guttikunda, Sourangsu Chowdhury, Patrick Kinney, S. V. Subramanian, Michelle L. Bell & Rockli Kim

- Research in India has been limited in assessing whether socially disadvantaged populations are disproportionately exposed to higher PM2.5 concentrations due to the lack of timely socioeconomic data.
- To address this gap, a comprehensive dataset was created, incorporating socioeconomic parameters for a large number of clusters (villages in rural India and census-blocks in urban

India) using a precision-weighted methodology. This dataset considered factors such as caste, religion, poverty, education, and access to household amenities.

- Findings revealed that factors like caste and socioeconomic class are significant risk factors for PM2.5 exposure, with notable differences between urban and rural areas and when considering specific PM2.5 sources.
- This research highlights the need for a nuanced Environmental Justice (EJ) framework in India to account for these variations and emerging inequalities in PM2.5 exposure.

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Long-term trend of $PM_{2.5}$ over five Indian megacities using a new statistical approach

Khaiwal Ravindra, Sreekanth Vakacherla, Tanbir Singh, Adithi R. Upadhya, Preety Rattan & Suman Mor

- PM2.5 is a significant contributor to air pollution in India, affecting air quality and public health negatively.
- This study utilizes the TTAinterfaceTrendAnalysis, an 'R' language-based Graphical User Interface package, to assess annual and month-wise PM2.5 trends in five Indian megacities: New Delhi, Kolkata, Mumbai, Hyderabad, and Chennai. The package facilitates various statistical analyses.
- Month-wise PM2.5 trends were found to be statistically insignificant across all cities, while annual trends, with or without data smoothing, were statistically significant, indicating a decline in PM2.5 levels. The study also considers factors like autocorrelation and normality.
- This research is the first to use TTAinterfaceTrendAnalysis for long-term PM2.5 trend analysis, and it assesses the sensitivity of trend estimates when including PM2.5 data during the COVID-19 lockdown, which had a variable impact on PM2.5 long-term trends in the studied cities.

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Let Delhi breathe! Air pollution tops citizens' concerns

In a recent survey carried out by Greenpeace across seven major cities worldwide, air pollution stands out as the primary environmental concern in Delhi. Following closely behind are issues related to waste management, rising temperatures, and water pollution. This survey was conducted as a part of the Urban Justice campaign, which seeks to promote cities as hubs for climate action, resilience, and equity. Over 1,000 individuals from Delhi actively participated in this initiative, with the majority expressing a positive outlook regarding the city's future. In terms of enhancing urban mobility, survey respondents displayed strong support for initiatives such as dedicated bus lanes, cycle lanes, improved pedestrian pathways, and increased investments in metro and train systems.

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Delhi air pollution: Supreme Court asks report from CAQM on air pollution control measures in Delhi-NCR

On 10th Oct, the Supreme Court made a formal request to the Commission for Air Quality Management (CAQM) to furnish a report detailing the measures being put into action to combat air pollution in the Delhi region and its vicinity. As reported by PTI, a bench consisting of Justices Sanjay Kishan Kaul and Sudhanshu Dhulia took note of the statements made by senior advocate Aparajita Singh, who is serving as an amicus curiae to the apex court in pollution-related cases. Singh emphasized concerns regarding air pollution during the upcoming winter season and the problem of crop residue burning. The bench recognized the substantial nature of these concerns raised by the amicus curiae and noted that these matters currently fall within the jurisdiction of the CAQM, as reported by PTI.

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Delhi government forms teams to tackle air pollution at 13 hotspots

Delhi has pinpointed 13 pollution hotspots, which include Narela, Bawana, Mundka, Wazirpur, Rohini, RK Puram, Okhla, Jahangirpuri, Anand Vihar, Punjabi Bagh, Mayapuri, and Dwarka. In an effort to enhance air quality in these areas, the Delhi government has established interdepartmental teams. This announcement was made by Environment Minister Gopal Rai on Wednesday, following a crucial joint meeting with officials from all relevant departments to discuss strategies for reducing air pollution in the city. The selection of these 13 hotspots was based on the annual average concentrations of PM10 and PM2.5 in these specific regions.

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World crosses key 1.5ºC warming mark for record number of days in 2023: Report

The prospect of defeating climate change remains distant, as indicated by a new report that raises concerns among scientists. According to the report, a significant warming threshold is looming, with at least one-third of 2023 experiencing an average global temperature that is 1.5ºC higher than pre-industrial levels. Maintaining a long-term trajectory below this threshold is of utmost importance to mitigate the perilous consequences of climate change. Notably, 2023 is already on track to become the hottest year on record, and there are worries that 2024 could surpass even this record. These insights are drawn from the BBC's recent analysis of climate change and follow a period of record-high temperatures in September and a summer marked by extreme weather events worldwide.

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Climate change to trigger mortality risks from air pollution, flooding: Researchers warn ahead of COP28

Health can be a powerful driver for tackling climate change, says World Health Organization Director Maria Neira. Discussing climate change from a health perspective, focusing on reducing conditions like asthma and lung cancer, can accelerate climate negotiations. For the first time, COP28 will have a dedicated day on December 3, 2023, to address health in the context of climate change. The British Medical Association's journal features new studies on the climate-health connection ahead of the conference.

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Urgent action to cut methane emissions from fossil fuel operations essential to achieve global climate targets

According to a new report by the International Energy Agency (IEA), in collaboration with the United Nations Environment Programme (UNEP) and the Climate and Clean Air Coalition (CCAC), reducing methane emissions from fossil fuels is crucial alongside decarbonizing our energy systems to limit global warming to 1.5 °C. This report emphasizes the need for targeted actions to cut methane emissions, as reductions in fossil fuel demand alone may not happen fast enough to meet climate goals. Rapid methane emission cuts could prevent a 0.1 °C temperature rise by mid-century, equivalent to removing all cars and trucks from the world's roads.

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World Mental Health Day: Experts Highlight Link Between Air Pollution and Anxiety

With deteriorating air quality ahead of Diwali in Delhi-NCR, experts warn that air pollutants could lead to brain inflammation, causing anxiety, depression, and memory problems. They stress that any form of pollution is harmful to mental well-being, and environmental changes like extreme weather events can also impact mental health. Delhi's air pollution is reducing life expectancy by 11.9 years, according to a recent study.

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